2020 Scientific Advisory Committee Meeting
Teleconference, Richland, WA, April 23 – 24, 2020

Research and Operation in FY2021

Sergei Y. Tolmachev, USTUR Director
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College of Pharmacy and Pharmaceutical Sciences
Washington State University

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"Learning from Plutonium and Uranium Workers"

College of Pharmacy and Pharmaceutical Sciences
Washington State University

FY2021: USTUR at Glance

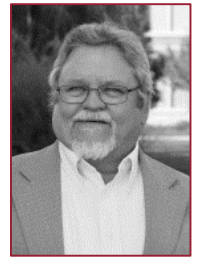
- Fiscal year 2021 (FY2021): 4/1/2020 – 3/31/2021
- FY2021 DOE funding: $1,200,000
- Operated by: Washington State University, College of Pharmacy and Pharmaceutical Sciences
- Operated under: Central DOE IRB #WASU-68-50181 (9/11/2020)
- Supported full-time equivalent (FTE)
  - ✓ Faculty and staff: 6.5
  - ✓ Temporary appointment: 1.0

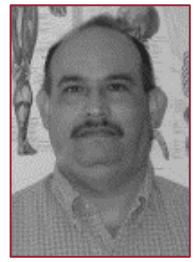
Organization Structure and Personnel










WSU College of Pharmacy and Pharmaceutical Sciences
Prof. Kathryn E. Meier, PhD
Associate Dean

Scientific Advisory Committee
Roger McClellan, *Toxicology, Chair*
Janet Benson *(incoming), Toxicology*
Luiz Bertelli, *Health Physics*
Heather Hoffman, *Epidemiology*
Timothy Ledbetter, *Ethics*
Thomas Rucker, *Radiochemistry*
Arthur "Bill" Stange, *Occupational Health*

USTUR Research Center
Sergei Y. Tolmachev, PhD
Director, Principal Investigator
Research Professor

Administration & Finances
Margo D. Bedell, AAS
Program Specialist II

Anthony E. Riddell, MPhil, MSRP† *Adjunct Faculty*
Daniel J. Strom, PhD, CHP‡ *Adjunct Faculty*

Operation/Research/Academics
Stacey L. McComish, MS
Associate in Research
Maia Avtandilashvili, PhD
Assistant Research Professor
Martin Šefl, PhD
Post-doctoral Researcher

National Human Radiobiological Tissue Repository (NHRTR)
Florencio T. Martinez, ASCP
‡*Med. Tech., Prosector*
Eric L. Kiesel, MD, PhD
‡*Consultant Forensic Pathologist*

Radiochemistry Laboratory
Sergei Y. Tolmachev, PhD
Principal Radiochemist
George Tabatadze, PhD
Assistant Research Professor
Elizabeth M. Thomas, BS
Laboratory Technician II

Alex Tabatadze, MS‡ *Programming*
Minh Pham, BS‡ *IT Support*
Mariya Tolmachova, MA‡ *Editor*

Extramural Projects and Collaborations
USTUR/NHRTR 'Work for Others'
(Externally Funded)

† - Non-paid

‡ - Part-time/Contractor

Specific Aims

- Manage and operate the Registries
- Conduct scientific research
- Demonstrate and promote broader use and application of USTUR research, data, and materials

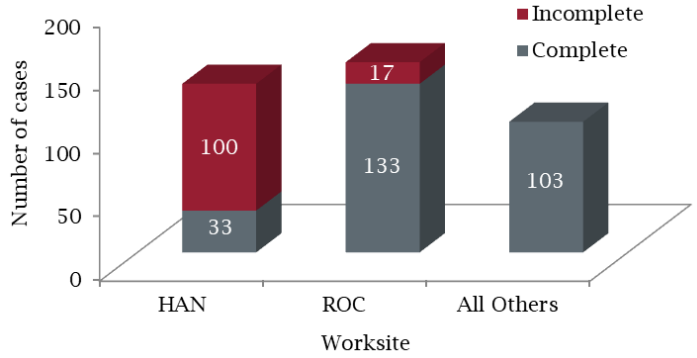
Management and Operation

- Communicate with Registrants and next-of-kin
- Accept Registrant donations
- Operate the National Human Radiobiological Tissue Repository (NHRTR)
- Complete radiochemical analysis of tissues
- Develop and populate USTUR information systems

Operational Tasks

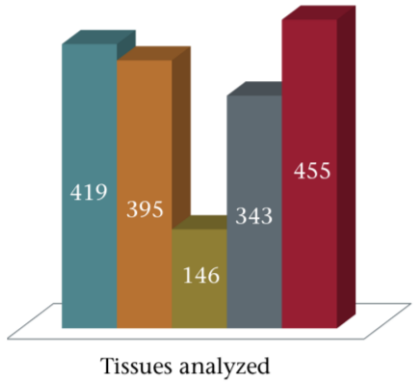
Health Physics database

- All worksites except Hanford (2020)
- All cases (2028)



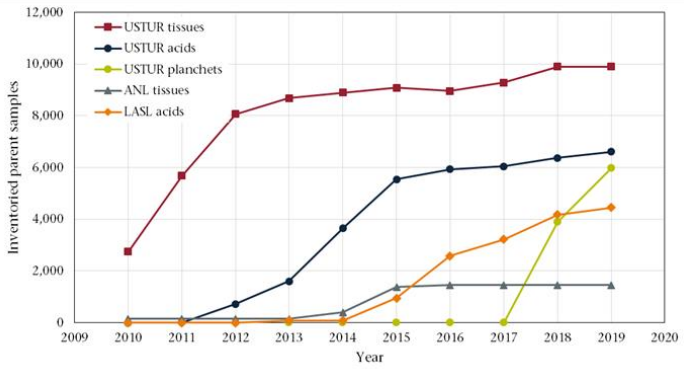
Radiochemistry analysis and database

- Analyses of remaining partial bodies (2020 – 2021)
- Database harmonization (2021)
- Analyses of all cases (2029)



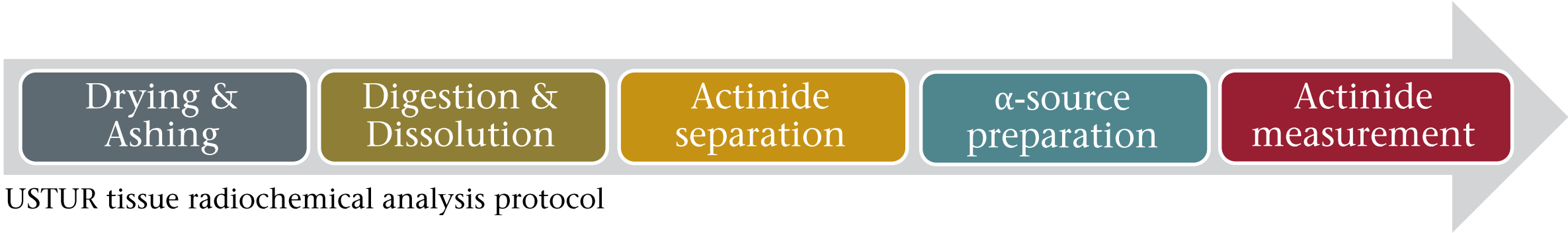
NHRTR inventory

- LANL acid solutions (2022)
- RDP frozen tissues (2024 – 2029)
- RDP other materials (2029 and beyond)



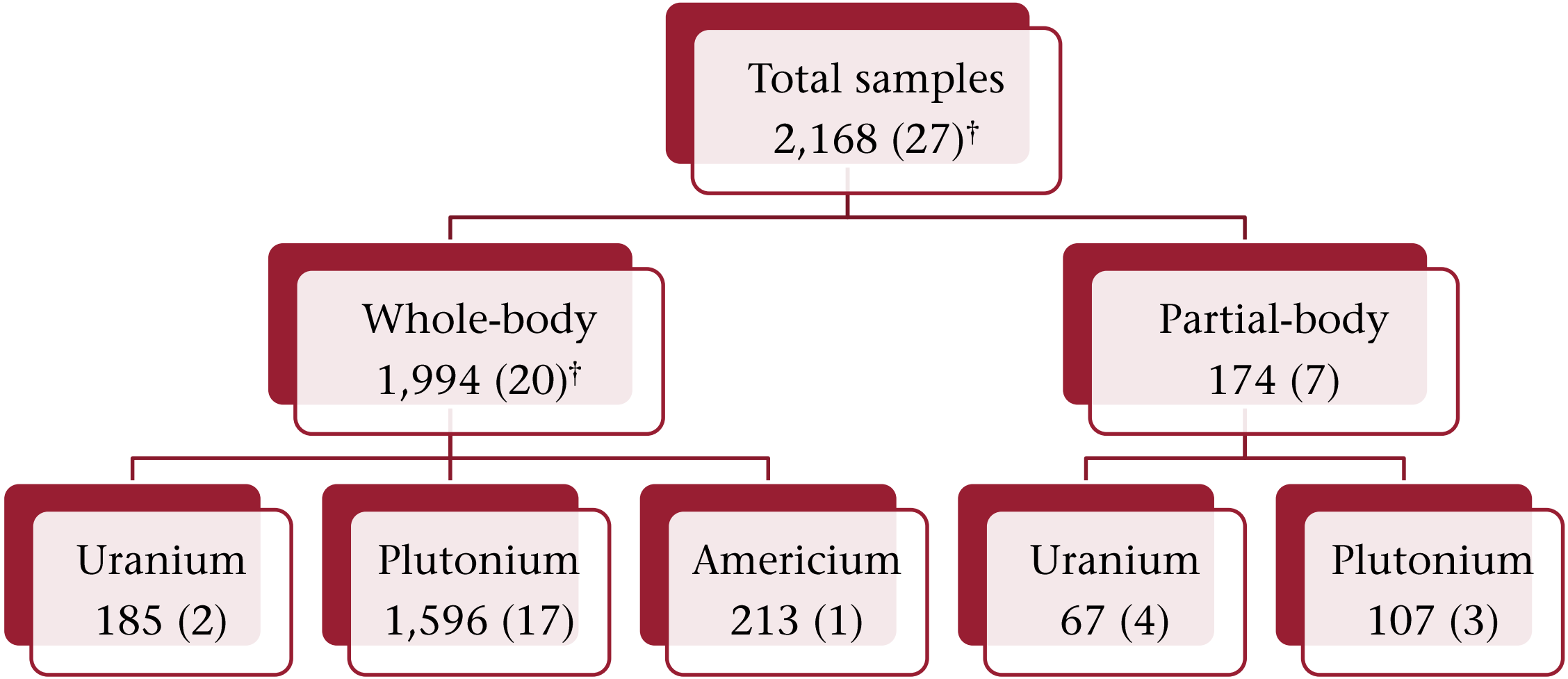
Radiochemistry Group Tasks

- Publish Data Quality Objectives (DQO) document
- Complete protocol for urine collection from leaving Registrants
- Reduce tissue sample backlog: *Complete all partial-body cases*
- Populate and harmonize Radiochemistry database with other USTUR databases
- Install new (plastic) laboratory fume hood(s) and ventilation system



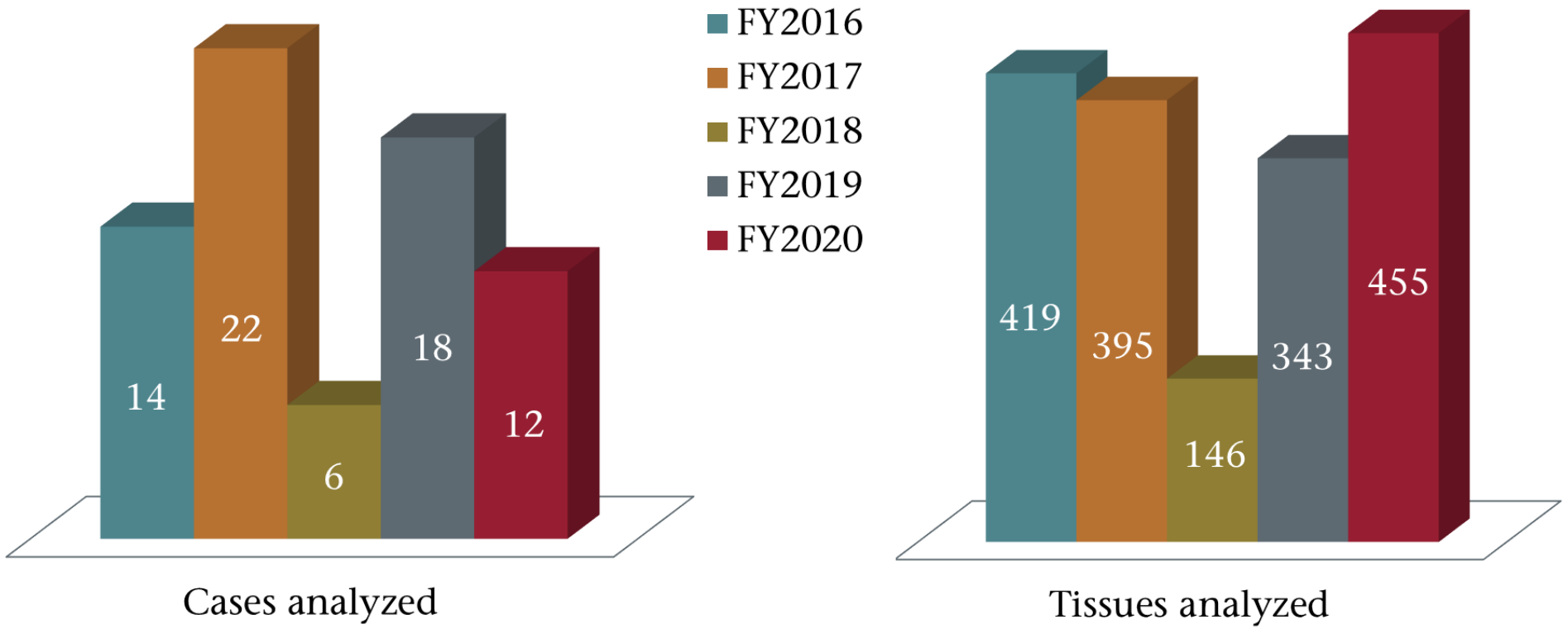
USTUR tissue radiochemical analysis protocol

Tissue Sample Backlog



† - excluding two Thorotrast cases

Radiochemical Analysis Throughput



Cases analyzed

Tissues analyzed

Internal Research Projects

- Evaluating uncertainty in radiation dose assessment: *liver and skeleton*
- Actinides in the skeleton: C_{bone}/C_{skel} *bone scaling factor*
- 'Systemic' actinides partitioning between liver and skeleton
- Beryllium retention, distribution, and biokinetics in human body
- Long-term retention, distribution, and biokinetics of enriched uranium in a female donor

New Collaboration: *Q-band Electron Paramagnetic Resonance Dosimetry*

- Dr. Alexander Romanyukha: Naval Dosimetry Center, Armed Forces Radiobiology Research Institute
- PhD project: *Electron paramagnetic resonance dosimetry in tooth enamel from former nuclear workers*
- Q-band EPR benefit: 2–4 mg sample size
- USTUR support: 39 (molar and pre-molar) teeth from ten individuals
- Pulverized materials will be return to the USTUR

Q-BAND EPR BIODOSIMETRY IN TOOTH ENAMEL MICROSAMPLES: FEASIBILITY TEST AND COMPARISON WITH X-BAND

A. Romanyukha,*† C. A. Mitchell,* D. A. Schauer,‡ L. Romanyukha,* and H. M. Swartz*‡

Radiat Environ Biophys
DOI 10.1007/s00411-013-0511-8

ORIGINAL PAPER

Q-band electron paramagnetic resonance dosimetry in tooth enamel: biopsy procedure and determination of dose detection limit

Alex Romanyukha · François Trompier · Ricardo A. Reyes

DOE Russian Health Studies Program

- US/Russian bi-national agreement: 1994
- Conducted under: the Joint Coordinating Committee for Radiation Effects Research (JCCRER)
- Lead agencies: Department of Energy and Federal Medical Biological Agency

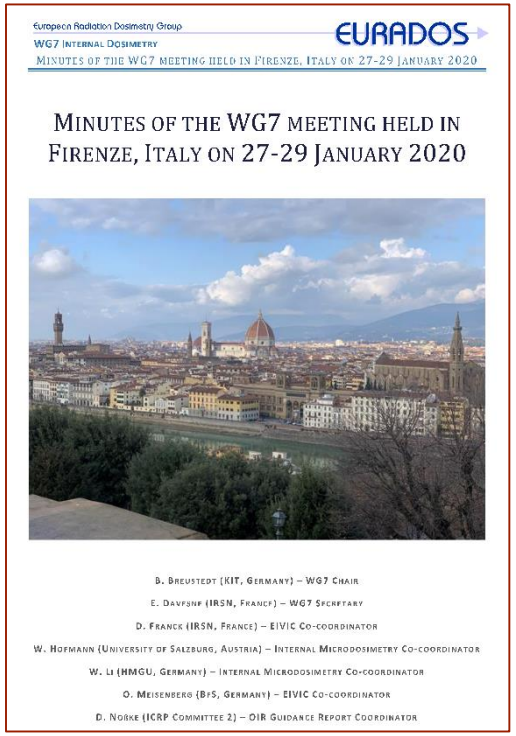
- DOE Program Manager: Joey Y Zhou, effective April 1, 2020
- Project 2.4: *Mayak Worker Dosimetry* (US PI – Bruce Napier, PNNL)
- Project 2.8: *Mayak Worker Tissue Repository* (US PI – Christopher Loffredo, Georgetown University)

Collaboration with Southern Urals Biophysics Institute

- Interaction/collaboration since 1995
- Topics: radiochemistry and actinide dosimetry
- Joint publications (1996–2002; 2017–2019): 16
  - ✓ Conference abstracts: 3
  - ✓ Conference proceeding papers: 2
  - ✓ Journal manuscripts: 11
- Site visits and exchange
- On-site ‘training’ (radiochemistry)
- Russian Human Radiobiological Tissue Repository
  http://www.rhtr.subi.su

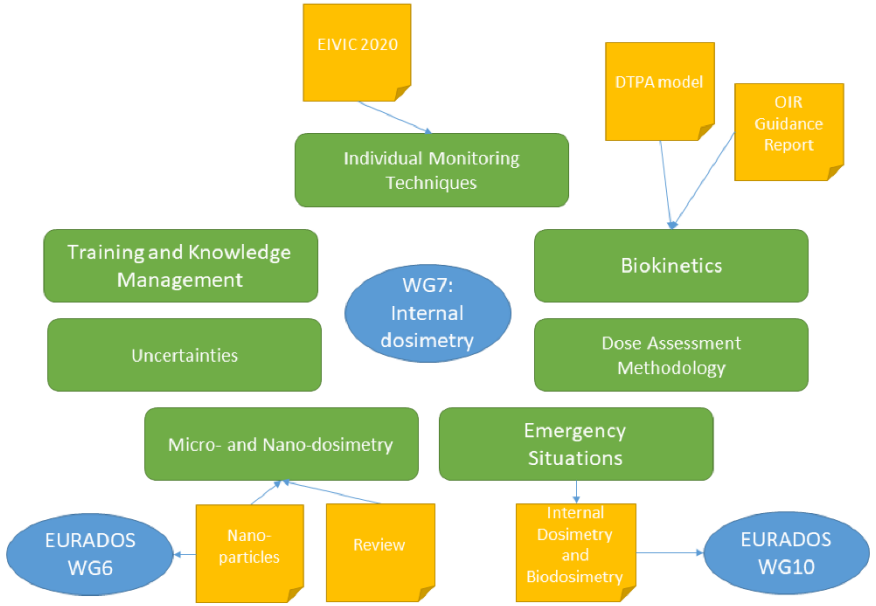
USTUR – EURADOS Research Topics

- Biological dosimetry for internal exposure: *on-going*
- Modeling DTPA decorporation therapy: *reborn*
- Nano- and microdosimetry: *new*
- Wound monitoring and dose assessment: *new*
- Dosimetry protocol for epidemiological studies: *new*


European Radiation Dosimetry Group
EURADOS
WG7 Internal Dosimetry
Minutes of the WG7 meeting held in Firenze, Italy on 27-29 January 2020

MINUTES OF THE WG7 MEETING HELD IN FIRENZE, ITALY ON 27-29 JANUARY 2020

B. Breustedt (KIT, Germany) – WG7 Chair
E. Davesne (IRSN, France) – WG7 Secretary
D. Franck (IRSN, France) – EIVIC Co-coordinator
W. Hofmann (University of Salzburg, Austria) – Internal Microdosimetry Co-coordinator
W. Li (HMGU, Germany) – Internal Microdosimetry Co-coordinator
O. Meisenberg (BfS, Germany) – EIVIC Co-coordinator
D. Noske (ICRP Committee 2) – OIR Guidance Report Coordinator



Modeling ^{241}Am Decorporation: *Reborn*

Brief history

- 2009 EURADOS WG7 meeting (Karlsruhe, Germany): Dr. A. C. James
- 2011 Sabbatical at the USTUR: Dr. Bastian Breustedt (Karlsruhe Institute of Technology)
- 2019 Publication: Breustedt et al. USTUR Case 0846: Modeling americium biokinetics after intensive decorporation therapy. Health Physics 117(2): 168–178.

PhD project

- Initial discussion: 2016
- Funding: Karlsruhe Institute of Technology (2020)
- Project duration: 2020–2023
- One-week visit to the USTUR: 2021
- One-month stay at the USTUR: 2021 and 2022

Karlsruhe Institute of Technology

Collaborative Research Network

Oak Ridge Institute for Science and Education

Oak Ridge National Laboratory

Vanderbilt University

National Council on Radiation Protection and Measurements

MURR

Missouri

Los Alamos National Laboratory EST. 1943

Public Health England

Northwestern University

Naval Dosimetry Center

Université de Pau et des Pays de l'Adour

react/ts

Université Laval

Pacific Northwest National Laboratory

EURADOS

KIT Karlsruhe Institute of Technology

一般財団法人 九州環境管理協会

Professional Service

- National Council on Radiation Protection and Measurement (NCRP)
  - ✓ Program Area Committee 6: *Radiation Measurements and Dosimetry*
  - ✓ Scientific Committee 6-12: *Brain Dosimetry for Internally Deposited Radionuclides*
  - ✓ Sub-committee of the Council Committee 2: *Radio- and Nuclear Chemistry*
- Health Physics Society: *International Collaboration Committee*
- Columbia Chapter of Health Physics Society: *Executive Council*
- Herbert M Parker Foundation: *Board of Trustees*
- Herbert M Parker Symposium: *Organizing Committee*
- Washington State University: *Radiation Safety Committee*
- Austin Biometrics and Biostatistics: *Editorial Board*
- Japanese Journal of Health Physics: *Editorial Board*

Upcoming Publications

- Giussani A, Lopez MA, Romm H, Testa A, Ainsbury EA, Degteva M, Della Monaca S, Etherington G, Fattibene P, Güclu I, Jaworska A, Lloyd DC, Malátová I, **McComish S**, Melo D, Osko J, Rojo A, Roch-Lefevre S, Shishkina E, Sotnik N, **Tolmachev S**, Wieser A, Woda C, Youngman M. EURADOS review of retrospective dosimetry techniques for internal exposures to ionising radiation and their applications. *Radiation and Environmental Biophysics*; **2020** (Accepted)
- Poudel D, **Avtandilashvili M**, Bertelli L, Klumpp J, **Tolmachev SY**. Long-term retention of plutonium in the respiratory tracts of two acutely-exposed workers: Estimation of bound fraction. *Health Physics*; **2020** (Submitted)

Upcoming (?) Conference Presentations

Conferences: 5

- National: 3
- International: 2

Presentations: 14

- Invited: 3
- Podium: 7
- Poster: 4

IRPA 15

ERPW 2020
28 Sept.-2 Oct.
Estoril, Portugal

HPS Specialists in Radiation Protection

ACS Chemistry for Life®

Invited Presentations

65th Annual Meeting of the Health Physics Society, National Harbor, Maryland, July 5 – 9, 2020

Technical Session: The Department of Energy Domestic and International Health Studies Programs

CANCELLED!

- Tolmachev SY, U.S. Transuranium and Uranium Registries: 2010 – 2020 research accomplishments and collaborative efforts
- Zhou JY and Šefl M. et al. Uncertainties in radiation dose assessment for internally deposited plutonium in support of radiation epidemiology
- Avtandilashvili M, et al. Beryllium in the tissues of former nuclear workers

U.S. DEPARTMENT OF ENERGY

HPS Specialists in Radiation Protection

Podium Presentations (I)

65th Annual Meeting of the Health Physics Society, National Harbor, Maryland, July 5 – 9, 2020

- Strom DJ. Internal dosimetry over the ages
- Strom DJ, et al. Internal dosimetry software over the ages
- Poudel D, et al. Long-term retention of plutonium in the respiratory tracts of two acutely-exposed workers

CANCELLED!

Podium Presentations (II)

5th European Radiation Protection Week 2020 (ERPW2020), Estoril, Portugal, September 28 – October 2, 2020

- Šefl M, et al. Plutonium biokinetics in human body from inhalation of soluble compound
- Avtandilashvili M, Tolmachev SY. Forty-eight-year follow-up of a female worker exposed to highly enriched uranium via chronic and acute inhalation

15th International Congress of the International Radiation Protection Association (IRPA15), Seoul, South Korea, January 18 – 22, 2021

- Zhou JY, et al. 50 years of the U.S. Transuranium and Uranium Registries: Key contributions, influence and impact on radiation protection
- Tolmachev SY, et al. Actinide elements in the human brain: 50-year experience at the U.S. Transuranium and Uranium Registries

Poster Presentations

66th Annual Meeting of the Radiation Research Society, Big Island, Hawaii, USA, October 18 – 21, 2020

- Šefl M, et al. Uncertainty analysis on organ doses after exposure to soluble plutonium material
- Tolmachev SY, Avtandilashvili M. Long-term retention and distribution of highly enriched uranium in occupationally exposed female
- Avtandilashvili M, Tolmachev SY. Biokinetics of highly enriched uranium in a female nuclear worker after complex inhalation exposure

2020 Fall American Chemical Society Meeting, San Francisco, California, USA, August 16 – 20, 2020

- Wegge D, et al. ICP-MS analysis of plutonium and other actinides in brain tissue of occupationally exposed individual

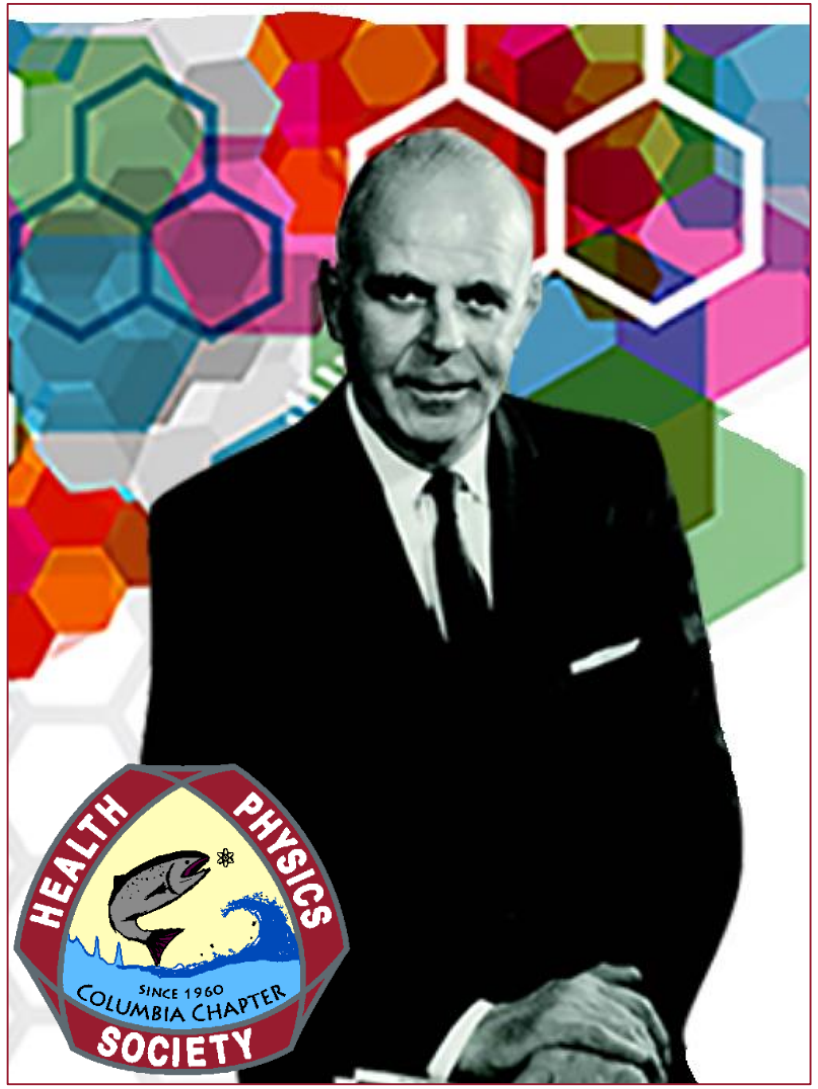
Publications in Preparation

- Avtandilashvili M, Tolmachev SY. *Forty-eight-year follow-up of a female worker exposed to highly enriched uranium via chronic and acute inhalation*
- Šefl M, Avtandilashvili M, Tolmachev SY. *Plutonium biokinetics in human body from inhalation of soluble compound*
- Strom DJ, Dumit S, Avtandilashvili M, McComish SL, Tabatadze G, Tolmachev SY. *Cylindrical representations of recycling biokinetic models*
- Tolmachev SY, Avtandilashvili M. *Long-term retention and distribution of highly enriched uranium in occupationally exposed female*
- Tolmachev SY, Avtandilashvili M, Brockman JD, Lariviere D, Momoshima N. *Beryllium in the tissues of occupationally exposed individuals: application to biokinetics*

Herbert M. Parker Memorial Symposium 2021

- Idea: Northwest regional (Washington, Oregon, Idaho) Health Physics meeting
- Date: April 9 – 10, 2021, Tri Cities, WA
- Topic: Radiation Protection – The Next Generation

  The symposium will bring young professionals and students together with experienced professionals in radiation protection and related fields to showcase the profession, share knowledge, experience, and cutting-edge research, and actively connect people with opportunities.



Thank you!